

Appl. No. : 10/814,319  
Filed : March 31, 2004

### **REMARKS**

By way of summary, Claims 1-74 were pending prior to this paper. Claims 42-54 are allowed by the Examiner. Claims 6, 17-18, 24, 26, 31-41, and 55-74 were previously withdrawn in response to a Restriction Requirement. This Amendment amends Claims 1-6 and 19-27 as presented above. Please cancel Claims 7-8. Please also add new Claims 75-76. After entry of this Amendment, Claims 1-6, 9-41 and 55-76 remain pending.

#### **Allowable Subject Matter**

Applicants thank the Examiner for withdrawing the Restriction Requirement from Claims 44-46 and 51-54, which include all the limitations of the allowed generic Claim 42. Applicants also thank the Examiner for allowing Claim 42 - 54.

#### **Interview Summary**

On April 29, 2008 the undersigned and the Applicants conducted a telephonic interview with the Examiner. Applicants thank the Examiner for his time and his consideration of the Applicants' comments. The Applicants and the Examiner discussed whether there would be any significant changes to the system disclosed by Lin et. al. if the variable attenuator were placed external to the oscillator. Applicants respectfully submit that if the variable attenuator of Lin were placed external to the oscillator disclosed by Lin et. al. then the oscillator as disclosed by Lin et. al. would fail to achieve its intended purpose, especially the purpose of improving the mode-locking as described in column 10, lines 5-8. Applicants further submit that if the variable attenuator were placed external to the oscillator disclosed by Lin et. al. then redesign of the oscillator would be required. The redesign may require balancing dispersion and SPM (a nonlinear effect related to power intensity). Applicants further submit that the intra-cavity attenuator disclosed by Lin alone or in combination with Price is not configured "such that attenuating said amplitude of the optical pulses coupled from said mode-locked fiber oscillator to said amplifier reduces the pulse width at an output of said compressor" as disclosed by Claim 1 nor would such feature be obvious.

#### **Claim Amendments**

Claim 1-6 and 19-27 are amended to alter the preamble to recite "An amplification system for outputting ..."

**Claim Rejections Under 35 U.S.C. § 103**

The Office Action rejects Claims 1-5, 7-16, 19-23, 25 and 27-30 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,570,892 by Lin et. al. in view of U.S. Patent No. 6,813,429 by Price et. al.

**Regarding Claim 1**

The Office Action states that Lin teaches some limitations of Claim 1. Applicants note and agree with the Office Action that Lin does not teach the amplifier, the variable attenuator and the compressor to be external to the fiber oscillator. The Office Action further states that Price overcomes the deficiencies of Lin and it would have been obvious to one of ordinary skill in the art to combine the system of Lin with the external oscillator of Price in order to decouple the pulse source from the other system components to eliminate the need to make adjustments to the oscillator when changing overall system output characteristics such as power and tuning. Applicants respectfully traverse this rejection.

Without conceding the propriety of combining Lin with Price, Applicants respectfully submit that Lin does not teach or suggest all the features of Claim 1. For example Lin does not teach or suggest an amplifier disposed *external to the modelocked fiber oscillator*, a variable attenuator disposed between said modelocked fiber oscillator and said amplifier configured to receive the optical pulses from said modelocked oscillator prior to reaching said amplifier, said variable attenuator having an adjustable transmission such that the amplitude of said optical pulses that are coupled from said mode-locked fiber oscillator to said amplifier can be reduced *at an output of said compressor* (emphasis added). See Figure 1, Figures 4 A-F, col. 4, lines 13-22 and col. 10 lines 5-9 of the Lin patent.

Price does not remedy the deficiencies of Lin. For example Price does not teach a variable attenuator disposed between said modelocked fiber oscillator and said amplifier *external to said modelocked fiber oscillator*, said variable attenuator having an adjustable transmission such that the amplitude of said optical pulses that are coupled from said mode-locked fiber oscillator to said amplifier can be reduced (emphasis added).

Applicants submit that Price discloses an optical source comprising a mode-locked laser 12 and an optical fiber amplifier 14. The wavelength of the pulses at the output of the amplifier is tuned by varying the power of the pump radiation from the pump laser. See for example Figure

1 and column 7, lines 47-67. Nowhere does Price disclose or remotely suggest a variable attenuator having an adjustable transmission such that the amplitude of said optical pulses that are coupled from said mode-locked fiber oscillator to said amplifier can be reduced as disclosed in Claim 1.

Applicants submit that the amplification system disclosed in Claim 1 has additional manufacturing and technical advantages described below that are not recognized or realized by Lin either alone or in combination with Price. For example, for a given oscillator an external amplifier can be carefully designed such that the amplified pulses from the amplifier can be compressed by an external compressor to output pulses with a reduced pulse width and have lower pedestals. However, since the oscillator performance can be different from one oscillator to another, it may be necessary to tailor an amplifier to match a given oscillator so as to obtain clean compressed pulses without pedestals. This approach may be cumbersome and difficult to implement in manufacturing. The amplification system disclosed in Claim 1 overcomes the need to match a given oscillator with an amplifier. Applicants discovered through experimentation the surprising and beneficial result that a variable attenuator which provides the appropriate reduction of the amplitude of the optical pulses from any given mode-locked fiber oscillator to any amplifier generates pulses with shorter pulse width and reduced pedestals at the output of the compressor. For example, when the input power of the pulses from a modelocked fiber oscillator was reduced from 3.2 mW to 0.4 mW by the variable attenuator the pulse width of the pulses at the output of the compressor reduced from 174 fs to 163 fs. Additionally, the pulses output from the compressor were cleaner and had lower pedestals when the input power is 0.4 mW as compared to the output from the compressor when the input power is 3.2 mW. Applicants submit that they have discovered a novel and simple pulse amplification system that can produce pulses with reduced pulse width and reduced pedestal that also has manufacturing benefits.

In view of the above discussion, Applicants respectfully submit that Claim 1 is patentable over Lin either alone or in combination with Price and that the invention recited in Claim 1 yields unexpected and beneficial results not provided by Lin either alone or in view of Price.

Regarding Claims 2-5

As discussed above, Claim 1 is patentable over Lin either alone or in view of Price. Claims 2-5 depend from Claim 1 and include all of the features of Claim 1 and recite unique

**Appl. No. : 10/814,319**  
**Filed : March 31, 2004**

combinations of additional features not taught or suggested by Lin either alone or in view of Price and are therefore patentable over Lin in view of Price. Applicants respectfully request that the rejections of Claims 2-5 be withdrawn.

Regarding Claim 9

The Office Action rejects Claim 9 as being unpatentable over Lin in view of Price. Applicants traverse this rejection and respectfully submit that Claim 9 is patentable over Lin in view of Price for at least the following reason.

Applicants note and agree with the Office Action that Lin does not teach the amplifier, variable attenuator and compressor to be downstream from the fiber oscillator as recited in Claim 9. Applicants respectfully submit that Price does not make up for the deficiencies of Lin as described above. For example Price does not teach “selectively attenuating the amplitude of said laser pulse prior to said amplifying of said laser pulse using an attenuator downstream from the laser cavity to further shorten said duration of said compressed laser pulses.” See also remarks above with respect to Claim 1. Therefore, Applicants respectfully request the Examiner to withdraw rejection of Claim 9 and allow it to issue.

Regarding Claims 10-11

As discussed above, Claim 9 is patentable over Lin either alone or in view of Price. Claims 10-11 depend from Claim 9 and include all of the features of Claim 9 and recite unique combinations of additional features not taught or suggested by Lin either alone or in view of Price and are therefore patentable over Lin in view of Price. Applicants respectfully request that the rejections of Claims 10-11 be withdrawn.

Regarding Claim 12

The Office Action rejects Claim 12 as being unpatentable over Lin in view of Price. Applicants traverse this rejection and respectfully submit that Claim 12 is patentable over Lin in view of Price for at least the following reason.

Applicants note and agree with the Office Action that Lin does not teach the amplifier, variable attenuator and compressor to be downstream from the fiber oscillator as recited in Claim 12. Lin also does not teach “adjusting said variable attenuator based on a measurement of said optical pulses to reduce the intensity of the optical pulses delivered to said amplifier and to shorten said pulses;” as recited in Claim 12. Price does not make up for the deficiencies of Lin as

Appl. No. : 10/814,319  
Filed : March 31, 2004

described above and also because Price does not teach “adjusting said variable attenuator based on a measurement of said optical pulses to reduce the intensity of the optical pulses delivered to said amplifier and to shorten said pulses;”. See also remarks above with respect to Claim 1. Therefore, Applicants respectfully request the Examiner to withdraw rejection of Claim 12 and allow it to issue.

Regarding Claims 13-16

As discussed above, Claim 12 is patentable over Lin either alone or in view of Price. Claims 13-16 depend from Claim 12 and include all of the features of Claim 12 and recite unique combinations of additional features not taught or suggested by Lin either alone or in view of Price and are therefore patentable over Lin in view of Price. Applicants respectfully request that the rejections of Claims 13-16 be withdrawn.

Regarding Claim 19

The Office Action rejects Claim 19 as being unpatentable over Lin in view of Price. Applicants traverse this rejection and respectfully submit that Claim 19 is patentable over Lin in view of Price for at least the following reasons.

Applicants note and agree with the Office Action that Lin does not teach the amplifier and filter to be external to the fiber oscillator. See also remarks above with respect to Claim 1.

Applicants further submit that the reflective grating 112 within reflective element 110 of Lin provides an intracavity frequency tuning mechanism for tuning the laser frequency within the spectral range of the doped fiber 130, and may be used to maintain polarization. See for example, column 7, lines 1-20 of Lin. Lin does not teach **“a spectral filter disposed external to the modelocked fiber oscillator; ... said spectral filter having a spectral transmission with a band edge that overlaps said spectral power distribution of said optical output of said modelocked fiber oscillator to attenuate a portion of said spectral power distribution and thereby reduce the spectral bandwidth, the pulse width of said optical pulses coupled from said modelocked fiber oscillator to said amplifier thereby being reduced.”** (emphasis added) as recited by Claim 19.

Price does not make up for the deficiencies of Lin as described above. For example, Price does not teach **“a spectral filter disposed external to the modelocked fiber oscillator; ... said spectral filter having a spectral transmission with a band edge that overlaps said spectral power distribution of said optical output of said modelocked fiber oscillator to attenuate a portion of**

Appl. No. : 10/814,319  
Filed : March 31, 2004

said spectral power distribution and thereby reduce the spectral bandwidth, the pulse width of said optical pulses coupled from said modelocked fiber oscillator to said amplifier thereby being reduced.” (emphasis added). In fact contrary to reducing the spectral bandwidth as disclosed in Claim 19, Price teaches *increasing* the spectral bandwidth of the pulses from the source to generate ultra broadband optical spectrum (emphasis added). See for example column 3, lines 20-25 of Price. Thus, Price teaches away from the limitations disclosed in Claim 19.

Therefore Applicants request the Examiner to withdraw rejection of Claim 19 and allow it to issue.

Regarding Claims 20-23 and 25

As discussed above, Claim 19 is patentable over Lin either alone or in view of Price. Claims 20-23 and 25 depend from Claim 19 and include all of the features of Claim 19 and recite unique combinations of additional features not taught or suggested by Lin either alone or in view of Price and are therefore patentable over Lin in view of Price. Applicants respectfully request that the rejections of Claims 20-23 and 25 be withdrawn.

Regarding Claim 27

The Office Action rejects Claim 27 as being unpatentable over Lin in view of Price. Applicants traverse this rejection and respectfully submit that Claim 27 is patentable over Lin in view of Price because Lin either alone or in combination with Price does not teach “reducing the spectral bandwidth of said spectral power distribution using a spectral filter external to said fiber resonant cavity such that said compressed optical pulses have a shorter duration” as recited in Claim 27.

See also remarks above with respect to Claim 1. Therefore Applicants request the Examiner to withdraw rejection of Claim 27 and allow it to issue.

Regarding Claims 28-30

As discussed above, Claim 27 is patentable over Lin either alone or in view of Price. Claims 28-30 depend from Claim 27 and include all of the features of Claim 27 and recite unique combinations of additional features not taught or suggested by Lin either alone or in view of Price and are therefore patentable over Lin in view of Price. Applicants respectfully request that the rejections of Claims 28-30 be withdrawn.

Appl. No. : 10/814,319  
Filed : March 31, 2004

### **New Claims**

Claim 7 was previously amended in an amendment filed on July 27, 2006. However the subsequent amendments filed on March 13, 2007 and September 7, 2007 did not reflect the changes made to Claim 7 in the amendment dated July 27, 2006. To avoid further confusion, Applicants have cancelled Claims 7-8 and added new Claims 75-76 which reflect the changes made to Claim 7 in the amendment filed on July 27, 2006.

Applicants respectfully submit that new Claims 75-76 depend from independent Claim 1. As discussed above Claim 1 is patentable over the references on record. Therefore Claims 75-76 which depend from Claims 1 and include all of the features of Claim 1 and recite unique combinations of additional features not taught or suggested by the cited references are also patentable over the cited references.

Applicants respectfully request the Examiner to allow Claims 75-76.

### **No Disclaimers or Disavowals**

Applicants respectfully note that the Examiner has characterized various teachings of the cited references in the November 27, 2007 Office Action. The fact that Applicants have not responded to all of the Examiner's characterizations is not to be taken as a concession that these characterizations of the references, alone or in combination, are accurate or complete. Also, by discussing only certain claim features, Applicants do not concede that the references, alone or in combination, teach or suggest other features of the claims. Moreover, the foregoing remarks in no way concede that patentability rests on a single feature or a subset of features of a claim; rather, it is the combination of features recited in each claim that makes each claim separately patentable.

Although the present communication may include alterations to the application or claims, or characterizations of claim scope or referenced art, Applicants are not conceding in this application that previously pending claims are not patentable over the cited references. Rather, any alterations or characterizations are being made to facilitate expeditious prosecution of this application. Applicants reserve the right to pursue at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution.

Appl. No. : 10/814,319  
Filed : March 31, 2004

Accordingly, reviewers of this or any parent, child or related prosecution history shall not reasonably infer that Applicants have made any disclaimers or disavowals of any subject matter supported by the present application.

#### SUMMARY

Applicants respectfully submit that all of the pending claims are allowable. Applicants respectfully request that the Examiner withdraw the rejections and pass Claims 1-5, 9-16, 19-23, 25, 27-30 and 75-76 to allowance.

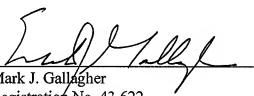
If examiner has any questions regarding the foregoing he may contact the undersigned telephonically at (949) 760-0404.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

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